Energy management in a continuous process plant

By

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1.0 Introduction:

Conventional methods of Energy Management in a continuous process plant are usually plagued by the following weaknesses:-

i. Greater emphasis on process efficiency than on Energy efficiency. Energy optimization is not a part of the control loop.

ii. Equipment is derated by a factor of safety of 3 and higher, to ascertain continuous production with little concern for Energy Consumption.

iii. Off-line monitoring of Energy Parameters, with Energy reading cycle of 1 to 2 hours, whereas the production data was taken at a particular point of time.
(Eg.8 AM). This leads to Errors in Energy and specific Energy readings.

iv. Use of Analog meters, which are inherently not as accurate as digital metering.

2.0 A New Perspective

With energy costs increasing faster than the rate of inflation, combined with the freeing of imports, all hitherto protected Industries have to face the challenge of overcoming the price war, and creating adequate profits for future growth. This has created an immense need for cost consciousness among all the plant personnel along with the need to maintain international standards of quality. Towards this endeavour, it has been observed that Energy Management and Energy Conservation measures are indeed a major step in improving bottom lines.

This is possible by having a continuous Energy improvement program based on real-time, on-line, plant data collection, data analysis, data interpretation, decision-making and Energy savings implementation, in a closed loop.

The key factor for the success of the above is the speed and accuracy of data collection and its integration with Enterprise Resource Planning packages (ERP).

3.0 Energy Management Network

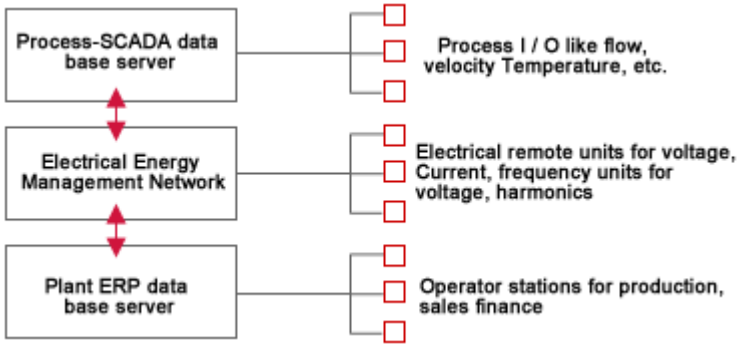


FIG1

A typical configuration of an effective Energy Management Network is indicated in figure-1

Enterprises Energy Management Network

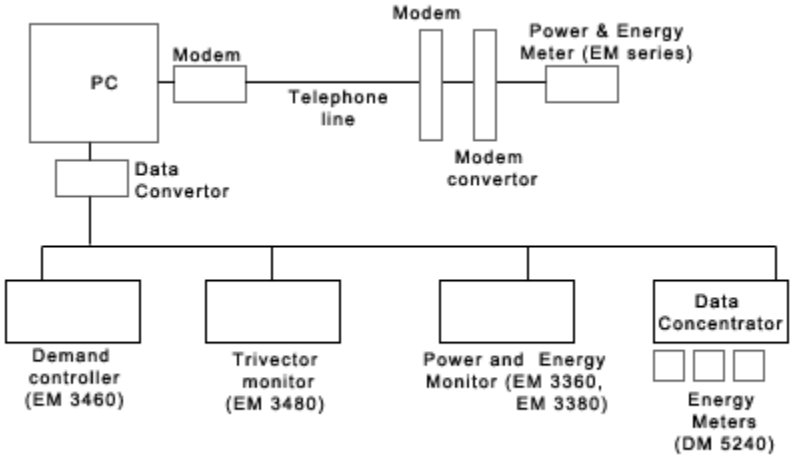
The three data base servers should be able to communicate between each other over the network. Once this requirement is fulfilled, Energy data can freely flow in the organization, to fulfill the objective of data analysis and corrective actions.

4.0 The Conzerv Advantage

Conzerv Systems has created a niche in the field of Electrical Energy Management Networks, which forms a part of the enterprise Energy Management Systems (see **Fig–1**). Many Electrical parameters need online measurements and real time controls, the most important one being the maximum demand control. Total Harmonics Distortion is creating unpredictable problems in Industries, which is created due to non-linear loads like variable speed drives soft starters, DC drives and electronic ballasts. Some of the identified problems include transformer overheating, fuse blowing, CNC system malfunction, computer data corruption, frequent breaker tripping, etc., Hence monitoring of industrial Harmonics is very important. Other parameters needed to monitor quality of power include power factor, apparent power, reactive power, active power, number of trips run hours and trip hours of a feeder. Conzerv supplies a range of instruments to address all these complex parameters.

5.0 The Network

A typical configuration is indicated in figure –2



Conzerv's Electrical Management Network

1. Remote units: Installed at various factory load monitoring points.

2. Data Concentrator : used to convert the Energy pulse outputs from the Energy Meters to RS 485 output.

3. Data communication cable: This is the RS 485 communication backbone, over which all remote units get connected to.

4. Data convertor: This is a RS 232 to RS 485 convertor.

5. Modem: used for long distance communication over telephone lines

6. Modem convertor: This is a modbus to modem convertor used for modem communication.

7. Personal computer: All the data from the remote units get logged into the computer for meeting the energy management goals.

Conzerv Electrical Energy Management Network meters are mounted on the control panels near the feeders and loads. The mounting of the meters are carried out as follows.

	Location	Type of meter preferred	Benefits achieved
a.	At incomer	Smart Demand Controller – EM 3460	• Maximum Demand Control • Cross checking Electricity of board readings • Monitor quality of incoming power
b.	At power control centers, motor control centers.	Trivector Monitors (EM 3480) and Power and Energy Monitors (EM-3360)	• Quality of power • Sectional Energy Monitoring ● Sectional Energy performance reporting
c.	Critical end loads like HT drives, compressor, vacuum pumps etc.,	Power and Energy Monitor (EM – 3380)	• Load Energy consumption • Load diagnostics ● Load run hours
d.	Non-critical end loads like pumps, blowers, conveyors etc.,	Energy Meters (DM5240)	● Load Energy Consumption hourly, shift wise, weekly and monthly
e.	Critical long distance loads like remote mines, remote substations, remote water pumps.	Modem communications interface (see figure-2)	• Uses existing telephone lines ● Saves on data cabling costs

6.0 Conclusion

Continuous process plants can redefine the way they undertake Energy Management Studies by using modem Energy Management Technologies, giving fast Energy savings and fast paybacks, which in most cases has been less than a year. This is clearly a viable option for many industries where survival and growth are clearly defined as their organizational goals.

Case Study

A leading automobile manufacturing industry in South India manufacturing heavy vehicles, with more than 20 Departments and Shop floors and a very large Electrical Network identified the following and solved the same with the help of Energy Management Networks.

Though it was rest time for machines during lunch, the engineer found that nearly 200 to 300 units of power go wasted at the shop floor. This wastage and reports of leakage's made him work on an alternative energy monitoring system that would instantly point the source. Brainstorming sessions with the Energy Conservation Cell cued the installation of a central monitoring system.

A computerised energy management information system has been put to operation. This involved installing an Conzerv Smart Demand Controller at the main receiving station and nine power and energy monitors at the substations. The analog meters (which are not that very accurate) at the

nodal points were replaced with digital meters. This network transfers critical electrical data such as volts, amps, frequency, kilowatts and powerfactor to a central PC at the maintenance department. A eLANTM software package in the central station controls all the functions – pooling the nodes, acquiring the data, filing and analysing it.

The system helped in collecting shop-wise, shift-wise data. The process does not stop with monitoring alone. Once they knew that there is erratic consumption at a particular shop, the Manager is sounded and action taken. The system has thus helped in streamlining energy consumption in tune with production levels.

The investment for the above system is Rs. 7 lakhs and the overall savings through the project is Rs. 30 lakhs. The payback period is 3 months. The central PC acts as veritable data bank to help prepare trends, profiles, reports for further analysis and comparisons' with consumption patterns of the past.

Also a steep fall has been reported in power consumption during lunch time to just 38 units.